



FMCW Radar Level Transmitter

Sensorsystem®
Innovative Sensors & Controls for Automation

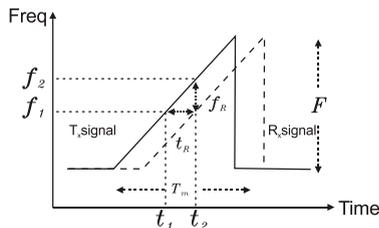
PRODUCT INTRODUCTION

FMCW Radar level transmitter is a non contact measuring device, which is suitable for high temp., high pressure, and corrosive applications. It is easy to install and free of maintenance, especially for the high accuracy requirement environment.

PRINCIPLE

FMCW radar adopts a high frequency signal, which is emitted via an antenna and swipes frequency increment by 0.5GHz during the measurement, reflected by the target surface and received at a time delay. The frequency difference, which is calculated from the transmitting frequency and the received frequency, which is directly proportional to the measured distance (or material surface).

The frequency difference then is processed by Fast Fourier Transformation (FFT) to identify the signal in Intermedium Frequency (IF). This FMCW radar is innate with signal / noise enhancement and filtering of echo-back via Phase-Lock Loop (PLL) circuit that is the best solution for complex environment and high accuracy measurement.



Design formula

$$Slop = \frac{F}{T_m} = \frac{f_R}{t_r} = \frac{2R}{c} \quad t_r = \frac{2R}{c}$$

$$R = \frac{F_R \times c \times T_m}{2F}$$

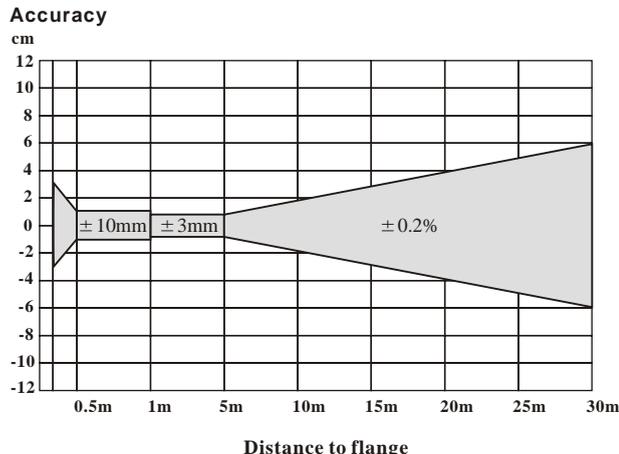
FEATURES

- Non contact measuring
- Corrosive and toxic liquid, hydrocarbons, slurries
- Not affected by specific gravity, pressure, temperature, viscosity, foam, and dust
- 5 digits LCM display
- Indicate signal wave inside the silo.
- Selection of Different Measurement unit(m, cm, mm, inch, ft, %, mA)
- Measuring distance and actual level.
- Language selection of traditional Chinese, simplified Chinese, English.
- 4-20mA/ 4 lead wires
- Modbus RS-485 to enhance isolation and easy for remote control.
- CE standards for isolation(EFT 2000V, B class or better)

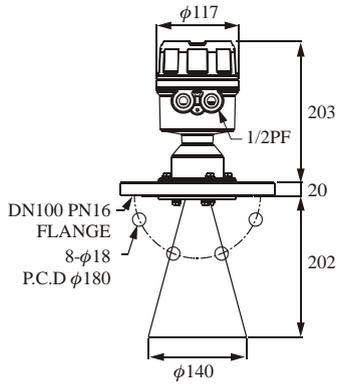
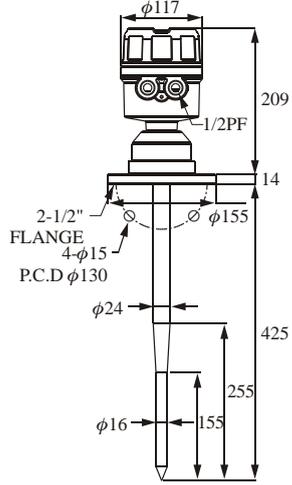
TEST STANDARDS

- High Voltage : IEC60947-2
- Isolated Resistance : IEC60092-504
- Power Supply Change : IEC60092-504
- Power Supply Failure : IEC60092-504
- Electrical Burst testing : IEC61000-4-4
- Voltage DIPS : IEC61000-4-11
- Humidity : IEC60068-2-30
- High/Low Temperature Test: IEC60068-2-1&2
- Protection Rating Ip65 : IEC60529

LINEARITY DIAGRAM



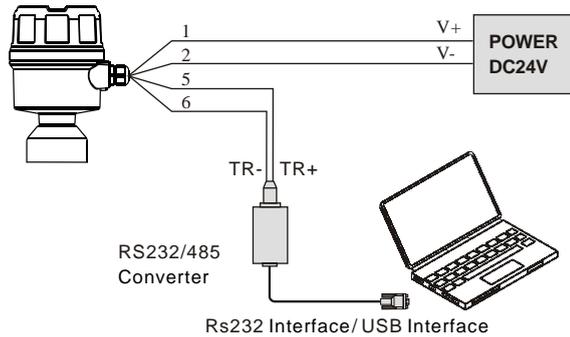
SPECIFICATION

<p>Dimension (Unit:mm)</p>		
Model	JFR-100	JFR-110
Measuring Range	20m(max.30m)	10m
Accuracy	± 10mm (0.5m~1m) ± 3mm (1m~5m) ± 0.2%mm (>5m)	± 10mm (0.5m~1m) ± 6mm (1m~5m) ± 0.2%mm (>5m)
Repeatability	± 2mm	± 2mm
Digital Communication	RS485(Isolated)	RS485(Isolated)
Ambient Temperature	-20~70°C	-20~70°C
Operating Temperature	-20~250°C	-20~150°C
Operating Pressure	0~64 bar	0~16 bar
Frequency	X Band	X Band
Analog Output	4~20mA/ 4 Wire	4~20mA/ 4 Wire
Power Consumption	100mA/ 24Vdc	100mA/ 24Vdc
Protection Rating	IP65	IP65
Min. Dielectric Constant	2.5	4
Min. Dielectric Constant	24Vdc ± 10%	24Vdc ± 10%
Local Display	5 digits LCM display	5 digits LCM display
Housing Material	Aluminum	Aluminum
Antenna Type	Horn	Wave Stick
Antenna Material	SUS 304/ 316	PTFE
Sampling Rate	1sec.	1sec.
Blind Distance	500mm	500mm

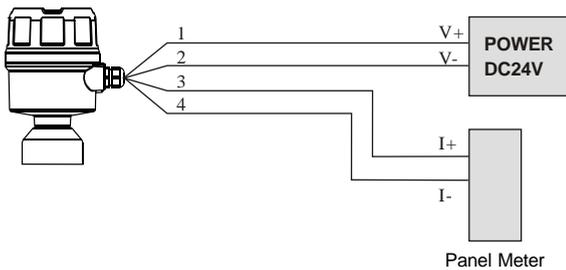
WIRING/CALIBRATION

WIRING INFORMATION

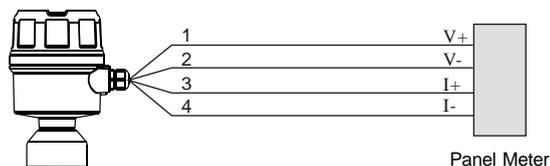
RS485 wiring



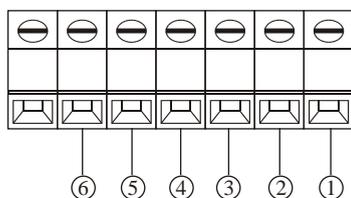
JFR Series and Indicator(External Power)



JFR Series and Indicator(Powered by panel meter)



WIRING DIAGRAM



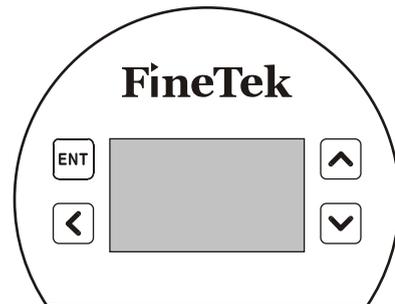
- ① Power Supply: V+
- ② Power Supply: V-
- ③ Analog Output: I+ (4~20mA)
- ④ Analog Output: I- (4~20mA)
- ⑤ Communication: TR+ (Rs485)
- ⑥ Communication: TR- (RS485)

CALIBRATION

Two ways to calibrate the JFR Series:

1. With display/adjustment module
2. By PC based FAS software

Adjustment module is an adjustment tool with 4 buttons to click on. It also has a transparent window to allow display reading.



5 digits LCM display

[ENT] Button

- Enter Edit status
- Confirm Edit
- Confirm parameter modification

[<] Button

- Select Edit
- Select parameter
- Parameter

[^] Button

- Return
- Cancel

[v] Button

- Increase
- Select

QUICK SETUP

FineTek
FineTek Co. Ltd.
WWW.FINE-TEK.COM

FINE-TEK
16.272
M CM MM INCH FT % MA

Press **UP**+**ENT** for 3 seconds to enter main menu

MAIN MENU 1
▶▶ SETTING
▶▶ DISPLAY
▶▶ DIAGRAM
▶▶ SERVICE

Click on "SETTING MENU 1.1" to enter

SETTING MENU 1.1
▶▶ LOW POINT
▶▶ HIGH POINT
▶▶ BLIND AREA
▶▶ MAX RANGE

Click on "LOW POINT 1.1.1" to enter

LOW POINT 1.1.1
04500
MM

Enter distance between flange and low level by using **DOWN** and **CHECK**. Click on **ENT** to save and return to 1.1

SETTING MENU 1.1
LOW POINT
▶▶ HIGH POINT
▶▶ BLIND AREA
▶▶ MAX RANGE

Click on "HIGH POINT 1.1.2" to enter

HIGH POINT 1.1.2
00000
MM

Enter distance between flange and high level by using **DOWN** and **CHECK**. Click on **ENT** to save and return to 1.1

SETTING MENU 1.1
LOW POINT
HIGH POINT
▶▶ BLIND AREA
▶▶ MAX RANGE

Click on "BLIND AREA 1.1.5" to enter

BLIND AREA 1.1.5
00500
MM

Enter blind distance counting from flange by using **DOWN** and **CHECK**. Click on **ENT** to save and return to 1.1

SETTING MENU 1.1
LOW POINT
HIGH POINT
BLIND AREA
▶▶ MAX RANGE

Click on "MAX RANGE 1.1.6" to enter

MAX RANGE 1.1.6
04500
MM

Enter tank height, save and go to setting 1.1

SETTING MENU 1.1
LOW POINT
HIGH POINT
BLIND AREA
▶▶ MAX RANGE

Press **UP** to enter main menu

MAIN MENU 1
▶▶ SETTING
▶▶ DISPLAY
▶▶ DIAGRAM
▶▶ SERVICE

Click on "DISPLAY MENU 1.2" to enter

DISPLAY MENU 1.2
▶▶ DISPLAY CONTEXT
▶▶ LCD CONTRAST

Click on "DISPLAY CONTENT 1.2.1" to enter

DISPLAY CONTEXT 1.2.1
▶▶ DISTANCE
▶▶ OBJECT HEIGHT
▶▶ PERCENTAGE
▶▶ CURRENT MENU

Save and click on **ENT** to return to 1.2. click on **UP** twice to return to the display.

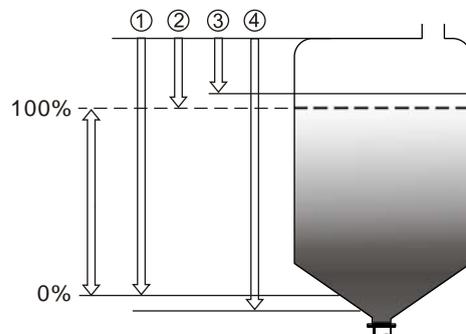
FINE-TEK
16.272
M CM MM INCH FT % MA

DIAGRAM

Measurement bench-mark starts at contact surface of connection.

- ① Low level calibration (menu 1.1.1)
- ② High level calibration (menu 1.1.2)
- ③ Blind Distance (menu 1.1.5)
- ④ Measuring Distance Setup (menu 1.1.6)

Note: Be aware of blind distance when measuring material high level.(Shown in ③)



Software Setup Calibration

Software Setup Calibration(FAS)

FAS calibration software can be utilized with JFR Series via RS485/RS232 to allow tank data reading and setup from PC.

Parameter Description

Low Point: Low point(4mA), measuring range from flange to low level.

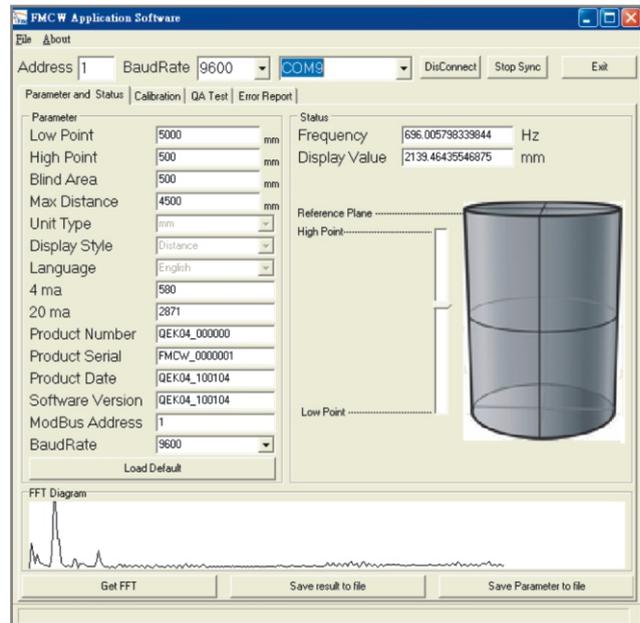
High Point: High point(20mA), measuring range from flange to high level.

Blind Area: Blind distance, distance starts from flange surface.

Max. Distance: Measuring range between low point and high point.

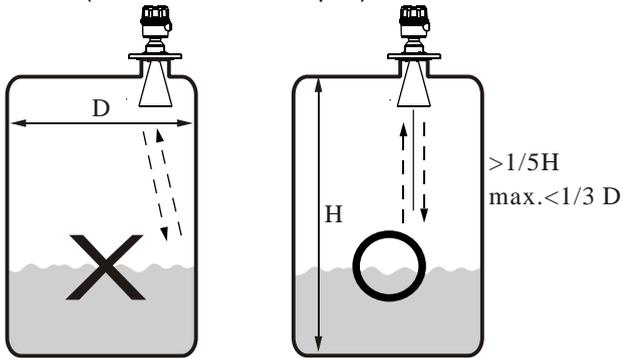
FAS Operation Instruction

1. Turn on FAS software
2. Go to Address, then choose 9600, COM5 from baudrate
3. Click on Connect.
4. Press "Stop Sync" to change parameter.
5. Press "GetFFT" to read wave reflection diagram.
Press "Stop Sync" to change preset parameter.

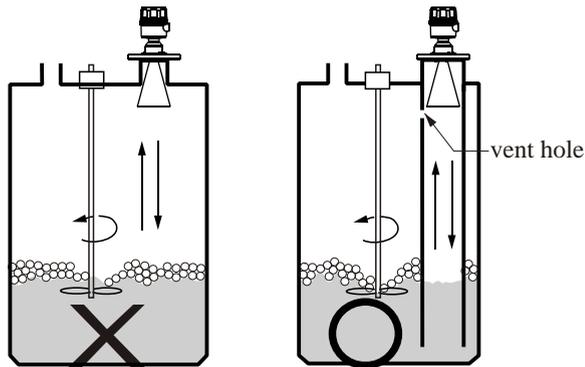


INSTALLATION

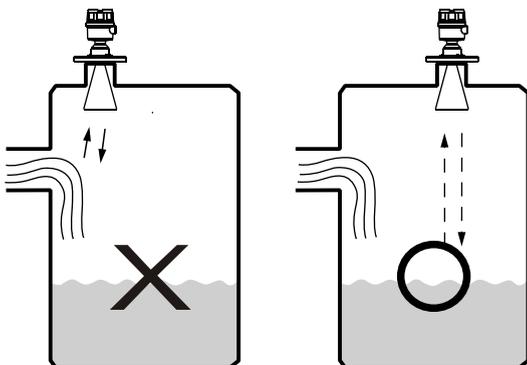
The axis direction of FMCW should be parallel with the wall, or be in orthogonal with the surface. For Install, the distance from the wall should $> 1/3 D$, and the height from the surface $> 1/5 H$ (Measurement Depth) is recommended.



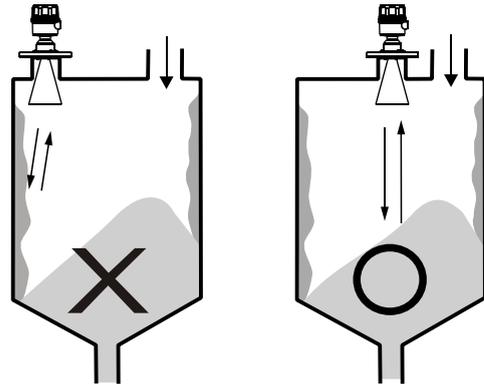
The turbulent or stirring will make the bubble and vortex that might interface with the measurement, it is recommended to install wave shield tube with vent hole to avoid from this situation.



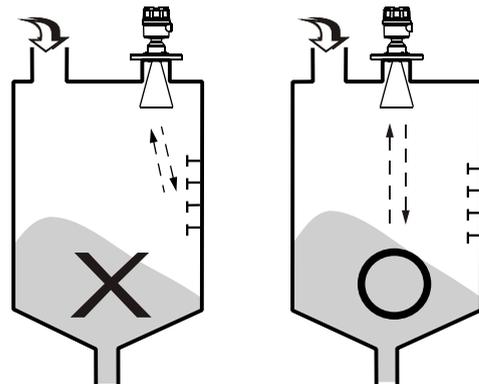
Device is to be installed away from material inlet to avoid disturbance caused by material or other obstacles.



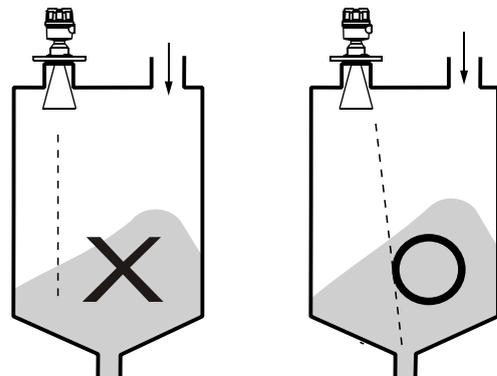
Device has to be installed away from the tank wall to avoid disturbance caused by reflection.



Device has to be installed away from the tank wall to avoid incorrect reflection.

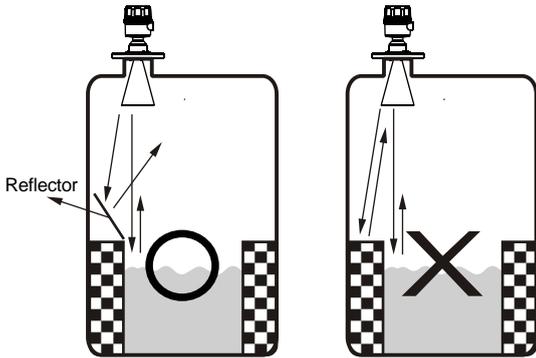


Microwave beam has to be close to material outlet for powder tanks.

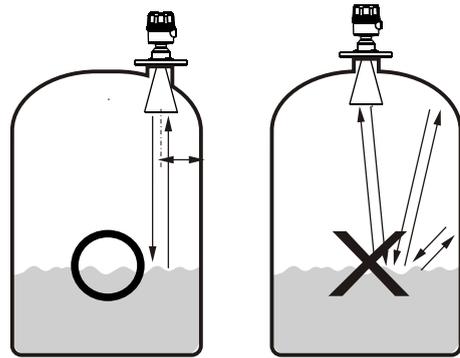


ORDERING INFORMATION

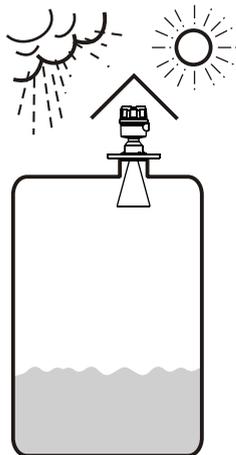
A reflector is recommended to be installed when there is disturbing obstacle to avoid false reflection.



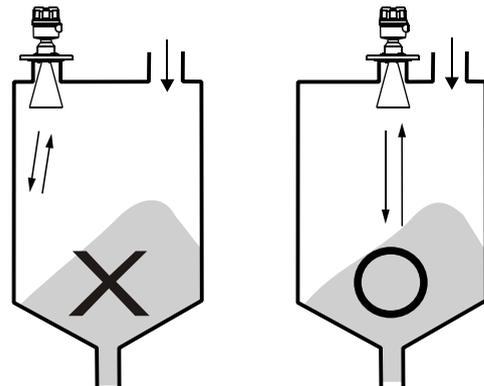
Please avoid center installation for arched top tanks for possible multiple reflection.



Sun/rain block is recommended for outdoor application.



The best installation position for cone shape tank with flat top is at the center spot for full measuring range.



ORDERING INFORMATION

JFR-1 00 - 0 - (EM)

Type _____

- 00: Horn Antenna
- 10: Wave Stick Antenna

Material _____

- 0: SUS304---Horn Antenna
- 6: SUS316---Horn Antenna
- E: PTFE-----Wave Stick Antenna

Connection _____

Size for flange or screw		Pressure range or other	
E: 1-1/2"(40A)	I: 4"(100A)	M: 5kg/cm ² JIS	W: PN10 (10Bar)
F: 2" (50A)	J: 5"(125A)	N: 10kg/cm ² JIS	X: PN16 (16Bar)
G: 2-1/2"(65A)	K: 6"(150A)	O: 150Lbs ANSI	Y: PN25 (25Bar)
H: 3" (80A)	S: Others	P: 300Lbs ANSI	Z: PN40 (40Bar)
			S: Others

Horn Antenna--- 4"(Min.)

Wave Stick Antenna --- 2-1/2"(Min.)